Lesson 2
Fractions, Decimals, Percents and Integers

Students will be able to:

1. Play "comparison games" involving fractions, decimals and/or integers,
2. Complete percent increase and decrease problems, and
3. Complete Pages 3–4, "Applying Number Sense and Operation Skills" (Student Edition), for homework.

Materials Needed:

Student Activity Book	Pages 1–2, "Applying Number Theory and Operation Skills" (Student Edition)
	Pages 3–4, "Applying Number Sense and Percent Concepts" (Student Edition)
Discovery Templates	Page 163, "Fraction Problem Generator" (Discovery Template 3)
	Page 164, "Decimal Problem Generator" (Discovery Template 4)
	Page 165, "Integer Problem Generator" (Discovery Template 5)
	Page 166, "Comparison Game Record Sheet" (Discovery Template 6)
	Page 167, "What's My Rule?" (Discovery Template 7)
Transparencies	"Applying Fraction Estimation Skills" (Transparency 57)
	"Applying Decimal Estimation Skills" (Transparency 58)
	"Applying Integer Estimation Skills" (Transparency 59)
	"What's My Rule?" (Transparency 60)
Manipulatives	
Miscellaneous	Communicator® clearboard, dry-erase marker and eraser for each student; a deck of playing cards for each pair of students

This lesson is designed to help students review and apply percent with respect to percent increase and decrease word problems.

Activity 1: Play "comparison games" involving fractions, decimals and/or integers.

Validate the answers and generate discussion for Pages 1–2, "Applying Number Theory and Operation Skills" (Student Edition).

In general, comparison games involve each player randomly generating two numbers that are then either added, subtracted, multiplied or divided. Each player's answers are then compared, and a "Decider" card is chosen to determine the winner of the round based on either the greater or lesser value of the solutions. Usually the first player to win from 3 to 5 rounds wins the game. As an option, you may have students use Discovery Template 4, which provides a record keeping sheet for any of these three games.

This activity includes variations of a fraction comparison game (Page 8 of this manual), variations of a decimal comparison game (Page 9 of this manual) and variations of an integer comparison game (Page 10 of this manual). Because of the similarity of the games, you need to model only one of the three games. You may assign various groups to play the different games or you may have the entire class play one of the games. The rules for each game follow. (*You may want to copy them for student use or to place them in a central area.*)

Fraction Operation Games

Players: Two or three

Objective: Be the first to score 3 points.

Math objective: To add, subtract, multiply, divide and/or compare fractions

Materials: "Fraction Problem Generator" (Page 163, Discovery Template 3), "Comparison Game Record Sheet" (Page 166, Discovery Template 6), and a standard deck of playing cards separated into a "Problem Generator" deck (to be used to select fractions from the sheet) and a "Decider" deck (to be used to determine the winner of the round).

Rules: Choose a game from the table at the right and create the appropriate "Problem Generator" and "Decider" decks. Use the rules for one of the variations of the game below.

When using the "Decider" deck: If a black face card (a spade or a club) is selected, the player whose answer has the greatest value wins the round. If a red face card (a heart or a diamond) is drawn, the player whose answer has the least value wins the round.

The first player to earn 3 points wins the game.

Game	Problem Generator Deck	Decider Deck
Add and Compare	Ace–Tens, Clubs and Spades	All face cards
Subtract and Compare	Ace–Tens, Clubs and Spades	All face cards
Multiply and Compare	Ace–Tens, Hearts	All face cards
Divide and Compare	Ace–Tens, Diamonds	All face cards

Variation 1

Each student selects a card from the "Problem Generator" deck and computes the sum, difference, product or quotient of the fractions in Column 1 and Column 2 of the "Fraction Problem Generator" template, making sure to represent the answer in simplest terms. Once answers are determined, students choose a card from the "Decider" deck to determine the winner of the round.

Variation 2

Each student selects a card from the "Problem Generator" deck and computes the sum, difference, product or quotient of the fractions in Column 1 and Column 3 or Column 2 and Column 3 of the "Fraction Problem Generator" template, making sure to represent the answer in simplest terms. *Note: When subtraction is used, the fractions in Column 1 or Column 2 must be subtracted from those in Column 3.* Once answers are determined, students choose a card from the "Decider" deck to determine the winner of the round.

Variation 3

Each student selects two cards from the "Problem Generator" deck and computes the sum, difference, product or quotient of the fractions using the fraction in Column 1 for the first card selected and the fraction in Column 2 for the second card selected (both from the "Fraction Problem Generator" template). Once answers are determined, students choose a "Decider" card to determine the winner of the round.

Variation 4

Instead of choosing one operation to play, you may want to include all four operations. To play this version, create the "Problem Generator" deck by placing all "Aces to nines" from all suits in to a deck (total 36 cards). This time, the "Decider" deck consists of all face cards and tens, for a total of 16 cards. Each student selects two cards from the "Problem Generator" deck, taking the number from Column 1 for the first card selected and the number in Column 2 for the second card selected (both from the "Fraction Problem Generator" template—*Note: Because ten is being used as part of the "Decider" deck, the numbers next to ten cannot be chosen.*). A card is then chosen from the decider deck. If it is a king, the numbers are added; if it is a queen, the numbers are subtracted; if it is a jack, the numbers are multiplied; and if it is ten, the number numbers are divided. Once answers are determined, students choose another card from the "Decider" deck to determine the winner of the round.

Decimal comparison Games

Players: Two or three

Objective: Be the first to score 3 points.

Math objective: To add, subtract, multiply, divide and/or compare fractions

Materials: "Decimal Problem Generator" (Page 164, Discovery Template 4), "Comparison Game Record Sheet" (Page 166, Discovery Template 6), and a standard deck of playing cards separated into a "Problem Generator" deck (to be used to select decimals from the sheet) and a "Decider" deck (to be used to determine the winner of the round).

Rules: Choose a game from the table at the right and create the appropriate "Problem Generator" and "Decider" decks. Use the rules for one of the variations of the game below.

When using the "Decider" deck: If a black face card (a spade or a club) is selected, the player whose answer has the greatest value wins the round. If a red face card (a heart or a diamond) is drawn, the player whose answer has the least value wins the round.

The first player to earn 3 points wins the game.

Game	Problem Generator Deck	Decider Deck
Add and Compare	Ace–Tens, Clubs and Spades	All face cards
Subtract and Compare	Ace–Tens, Clubs and Spades	All face cards
Multiply and Compare	Ace–Tens, Hearts	All face cards
Divide and Compare	Ace–Tens, Diamonds	All face cards

Variation 1

Each student selects a card from the "Problem Generator" deck and computes the sum, difference, product or quotient of the decimals in Column 1 and Column 2 of the "Decimal Problem Generator" template. Once answers are determined, students choose a card from the "Decider" deck to determine the winner of the round.

Variation 2

Each student selects a card from the "Problem Generator" deck and computes the sum, difference, product or quotient of the decimals in Column 1 and Column 3 or Column 2 and Column 3 of the "Decimal Problem Generator" template. *Note: When subtraction is used, the decimals in Column 1 or Column 2 must be subtracted from those in Column 3.* Once answers are determined, students choose a card from the "Decider" deck to determine the winner of the round.

Variation 3

Each student selects two cards from the "Problem Generator" deck and computes the sum, difference, product or quotient of the decimals using the number in Column 1 for the first card selected and the number in Column 2 for the second card selected (both from the "Decimal Problem Generator" template). Once answers are determined, students choose a "Decider" card to determine the winner of the round.

Variation 4

Instead of choosing one operation to play, you may want to include all four operations. To play this version, create the "Problem Generator" deck by placing all "Aces to nines" from all suits in to a deck (total 36 cards). This time, the "Decider" deck consists of all face cards and tens, for a total of 16 cards. Each student selects two cards from the "Problem Generator" deck, taking the number from Column 1 for the first card selected and the number in Column 2 for the second card selected (both from the "Fraction Problem Generator" template—*Note: Because ten is being used as part of the "Decider" deck, the numbers next to ten cannot be chosen.*). A card is then chosen from the decider deck. If it is a king, the numbers are added; if it is a queen, the numbers are subtracted; if it is a jack, the numbers are multiplied; and if it is ten, the number numbers are divided. Once answers are determined, students choose another card from the "Decider" deck to determine the winner of the round.

Integer Comparison Games

<u>Players</u>: Two or three

<u>Objective</u>: Be the first to score 3 points.

<u>Math objective</u>: Add, subtract, multiply, divide and compare integers

<u>Materials</u>: "Integer Problem Generator" (Page 165, Discovery Template 5), "Comparison Game Record Sheet" (Page 166, Discovery Template 6), and a standard deck of cards that has been separated into a "Problem Generator" deck (used to create problems) and an "Operation and Decider" deck (used to determine the operation to be completed or the winner of the round).

<u>Rules</u>: Choose the type(s) of integers that are used to create an addition, subtraction, multiplication or division problem from the table at the right. Create the "Operation and Decider" deck by creating a deck of all face cards and tens. Use the rules for one of the variations of the games below.

Integers	Problem Generator Deck*	Operation/Decider Deck
+ +	Clubs (Ace to nine)	Face cards and 10s
+ −	Spades(Ace to nine)	Face cards and 10s
+	Hearts(Ace to nine)	Face cards and 10s
−	Diamonds(Ace to nine)	Face cards and 10s
*Use only ace to fours from each suite to create answers that are all integers.		

<u>When using the "Decider" deck</u>: If a black card (a spade or a club) is selected, the player whose answer has the greatest value wins the round. If a red card (a heart or a diamond) is selected, the player whose answer has the least value wins the round. The first player to earn 3 points wins the game.

Variation 1

Alternately, each player selects a card from the "Problem Generator" deck and uses the numbers in Column 1 and Column 2, in that order, of the "Integer Problem Generator" template to complete the operation that is chosen when a card is selected from the "Operation and Decider" deck. After the players have determined the answers, the first player for the round chooses another card from the "Operation and Decider" deck to determine the winner of the round.

Variation 2

Alternately, each player selects two cards from the "Problem Generator" deck. The players use the number in Column 1 for the first card chosen and the number in Column 2 for the second card chosen (both from the "Integer Problem Generator" template), in that order, to complete the operation that is selected when a card is drawn from the "Operation and Decider" deck. After the players have determined the answers, the first player for the round chooses another card from the "Operation and Decider" deck to determine the winner of the round.

Variation 3

Use only the 5–9s of all suits and only the operation of division. Have students change all answers to decimal equivalents before comparisons and round winners are determined.

Variation 4

Instead of choosing one operation to play, you may want to include all four operations. To play this version, create the "Problem Generator" deck by placing all "Aces to nines" from all suits in to a deck (total 36 cards). This time, the "Decider" deck consists of all face cards and tens, for a total of 16 cards. Each student selects two cards from the "Problem Generator" deck, taking the number from Column 1 for the first card selected and the number in Column 2 for the second card selected (both from the "Fraction Problem Generator" template—*Note: Because ten is being used as part of the "Decider" deck, the numbers next to ten cannot be chosen.*). A card is then chosen from the decider deck. If it is a king, the numbers are added; if it is a queen, the numbers are subtracted; if it is a jack, the numbers are multiplied; and if it is ten, the number numbers are divided. Once answers are determined, students choose another card from the "Decider" deck to determine the winner of the round.

Fraction Problem Generator

	Column 1	Column 2	Column 3
Ace♣	$\frac{3}{4}$	$\frac{5}{8}$	$3\frac{3}{16}$
2♣	$1\frac{11}{16}$	$1\frac{3}{8}$	$1\frac{3}{4}$
3♣	$2\frac{3}{5}$	$\frac{4}{5}$	$2\frac{7}{10}$
4♣	$\frac{1}{3}$	$\frac{2}{9}$	$1\frac{7}{18}$
5♣	$\frac{1}{2}$	$\frac{9}{20}$	$2\frac{7}{10}$
6♣	$1\frac{7}{15}$	$\frac{4}{15}$	$1\frac{4}{5}$
7♣	$\frac{7}{8}$	$\frac{11}{24}$	$2\frac{3}{4}$
8♣	$\frac{11}{20}$	$\frac{1}{5}$	$1\frac{9}{10}$
9♣	$2\frac{9}{16}$	$\frac{3}{4}$	$3\frac{1}{2}$
10♣	$1\frac{2}{9}$	$1\frac{1}{9}$	$2\frac{2}{3}$
Ace♠	$\frac{1}{3}$	$\frac{1}{4}$	$2\frac{1}{5}$
2♠	$\frac{1}{2}$	$\frac{1}{5}$	$2\frac{1}{3}$
3♠	$\frac{1}{3}$	$\frac{2}{7}$	$1\frac{1}{4}$
4♠	$\frac{3}{4}$	$\frac{2}{5}$	$2\frac{1}{2}$
5♠	$\frac{2}{3}$	$\frac{1}{4}$	$1\frac{1}{7}$
6♠	$\frac{3}{10}$	$\frac{2}{7}$	$3\frac{1}{3}$
7♠	$\frac{8}{9}$	$\frac{1}{2}$	$1\frac{4}{5}$
8♠	$\frac{11}{12}$	$\frac{3}{5}$	$2\frac{6}{7}$
9♠	$\frac{5}{6}$	$\frac{2}{5}$	$1\frac{1}{7}$
10♠	$\frac{4}{7}$	$\frac{1}{2}$	$3\frac{1}{5}$

	Column 1	Column 2	Column 3
Ace♥	$\frac{1}{3}$	$\frac{1}{4}$	5
2♥	$\frac{1}{4}$	$\frac{1}{6}$	12
3♥	$\frac{1}{5}$	$\frac{1}{4}$	10
4♥	$\frac{1}{7}$	$\frac{1}{3}$	3
5♥	$\frac{1}{9}$	$\frac{1}{6}$	2
6♥	$\frac{2}{3}$	$\frac{4}{5}$	$1\frac{2}{3}$
7♥	$\frac{2}{9}$	$\frac{3}{4}$	$3\frac{1}{5}$
8♥	$\frac{4}{7}$	$\frac{1}{2}$	$2\frac{1}{4}$
9♥	$\frac{3}{5}$	$\frac{5}{6}$	$1\frac{1}{3}$
10♥	$\frac{7}{8}$	$\frac{4}{5}$	$2\frac{3}{5}$
Ace♦	$\frac{1}{2}$	$\frac{1}{4}$	2
2♦	$\frac{2}{3}$	$\frac{1}{9}$	1
3♦	$\frac{1}{4}$	$\frac{5}{12}$	8
4♦	$\frac{7}{15}$	$\frac{1}{3}$	7
5♦	$\frac{3}{5}$	$\frac{3}{10}$	$1\frac{3}{10}$
6♦	$\frac{2}{3}$	$\frac{1}{5}$	$1\frac{7}{15}$
7♦	$\frac{4}{7}$	$\frac{2}{3}$	$3\frac{10}{21}$
8♦	$\frac{5}{8}$	$\frac{3}{5}$	$4\frac{3}{20}$
9♦	$\frac{3}{10}$	$\frac{6}{5}$	$1\frac{7}{15}$
10♦	$\frac{2}{9}$	$\frac{3}{8}$	$2\frac{3}{4}$

Center card box:

− −	+ +
Q	K
− −	+ +
X X ÷ ÷	(div)
J	10
X X	÷ ÷

Decimal Problem Generator

	Column 1	Column 2
Ace♣	6	.2
2♣	12	.5
3♣	9	.3
4♣	18	0.6
5♣	14	0.7
6♣	80	0.8
7♣	35	0.7
8♣	20	0.4
9♣	45	0.9
10♣	50	0.1
Ace♠	1.4	.7
2♠	2.8	.4
3♠	3.6	.6
4♠	4.2	.7
5♠	1.2	.3
6♠	6.4	.8
7♠	7.2	.6
8♠	8.1	.9
9♠	6.3	.7
10♠	2.4	.6

	Column 1	Column 2
Ace♥	40	0.05
2♥	6	0.02
3♥	8	0.04
4♥	100	0.05
5♥	20	0.01
6♥	7	0.07
7♥	12	0.06
8♥	400	0.08
9♥	18	0.09
10♥	25	0.05
Ace♦	4.8	0.06
2♦	2.4	0.03
3♦	3.6	0.09
4♦	8.4	0.07
5♦	7.2	0.06
6♦	6.4	0.08
7♦	3.2	0.04
8♦	1.8	0.09
9♦	2.7	0.03
10♦	5.4	0.06

− Q −	+ K +
× J ×	**÷ 10 ÷**

Integer Problem Generator

	Column 1	Column 2
Ace♣	4	1
2♣	8	4
3♣	10	2
4♣	6	3
5♣	9	5
6♣	10	7
7♣	6	8
8♣	2	9
9♣	1	6
Ace♠	10	⁻5
2♠	9	⁻3
3♠	8	⁻2
4♠	9	⁻9
5♠	4	⁻7
6♠	7	⁻4
7♠	5	⁻2
8♠	6	⁻10
9♠	10	⁻8

	Column 1	Column 2
Ace♥	⁻8	8
2♥	⁻6	2
3♥	⁻9	3
4♥	⁻10	2
5♥	⁻6	4
6♥	⁻4	7
7♥	⁻5	6
8♥	⁻1	3
9♥	⁻8	10
Ace♦	⁻6	⁻2
2♦	⁻3	-3
3♦	⁻4	⁻2
4♦	⁻8	⁻8
5♦	⁻9	⁻6
6♦	⁻10	⁻3
7♦	⁻2	⁻6
8♦	⁻4	⁻9
9♦	⁻5	⁻8

− − Q − −	+ + K + +
× × J × ×	÷ ÷ 10 ÷ ÷

Number line:

⁻10   ⁻5   0   5   10
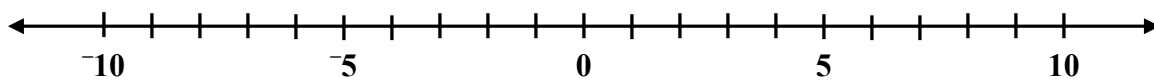
Equation Problem Generator

	Column 1	Column 2	Column 3
Ace♣	$x + 3$	7	$2x$
2♣	$x + 2$	⁻6	$4x$
3♣	$x - 5$	4	$2x$
4♣	$x - 1$	8	$5x$
5♣	$x - 10$	⁻1	$2x$
6♣	$x + 12$	10	$7x$
7♣	$x + 4$	⁻3	$2x$
8♣	$x - 9$	6	$3x$
9♣	$x - 3$	⁻5	$2x$
10♣	$x + 7$	0	$6x$
Ace♠	$7x$	10	$⁻4x + 5$
2♠	$3x$	⁻9	$2x - 7$
3♠	$5x$	20	$⁻4x + 3$
4♠	$4x$	⁻2	$2x - 1$
5♠	$8x$	4	$⁻4x + 6$
6♠	$⁻2x$	⁻1	$6x - 1$
7♠	$⁻3x$	6	$10x + 5$
8♠	$⁻5x$	⁻15	$⁻7x - 4$
9♠	$⁻10x$	5	$2x + 6$
10♠	$⁻12x$	⁻4	$⁻4x - 3$

	Column 1	Column 2	Column 3
Ace♥	$2x + 5$	11	$4x + 7$
2♥	$3x - 7$	⁻5	$6x + 5$
3♥	$5x + 3$	3	$x + 3$
4♥	$2x - 3$	⁻3	$⁻2x - 4$
5♥	$7x + 8$	1	$⁻x + 4$
6♥	$3x - 6$	⁻12	$4x - 1$
7♥	$5x + 1$	16	$4x + 5$
8♥	$3x - 1$	⁻1	$6x - 7$
9♥	$2x + 9$	7	$⁻2x - 15$
10♥	$9x - 2$	⁻11	$10x - 3$
Ace♦	$4(x + 3)$	12	$7(x + 3)$
2♦	$2(x - 8)$	-8	$8(x + 1)$
3♦	$6(x + 1)$	4	$9(x + 2)$
4♦	$5(x - 2)$	⁻7	$10(x - 2)$
5♦	$3(x + 4)$	6	$9(x + 1)$
6♦	$⁻2(x - 2)$	⁻11	$⁻5(x - 2)$
7♦	$⁻3(x + 5)$	6	$⁻6(x + 2)$
8♦	$⁻7(x - 3)$	⁻7	$⁻8(x - 2)$
9♦	$⁻4(x + 1)$	8	$⁻5(x + 1)$
10♦	$⁻2(x + 4)$	0	$⁻10(x + 1)$

Recording Sheet

Round	Player 1	Comparison Symbol	Player 2
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			